Trends in NINDS Extramural Grant Expenditures:
Basic and Applied Research

By: Anna Taylor[1], Christine Torborg[2], Robert Zalutsky[2], Paul Scott [2], Robert Finkelstein[1], and the NINDS Analysis Working Group (AWG)

[1] Division of Extramural Research, NINDS; [2] Office of Science Policy and Planning, NINDS

INTRODUCTION

In recent years, NINDS has become increasingly aware of the perception by the research community that Institute support for basic, curiosity-driven research has diminished. Triggered by the observation that NINDS funding for R01s had decreased by 10% between 2003 and 2008, we sought to extend this finding to more fully understand how our extramural research funds have been distributed across the spectrum of basic and applied research over time. Other questions addressed in this analysis include the extent to which NINDS and/or peer review may have influenced the observed trends and whether researchers at differing career stages choose categorically different types of research.

METHODS

To perform these analyses, the NINDS AWG developed simple definitions of basic and applied research that could be applied to applications in an unambiguous and reproducible way. Each of these broad categories was divided into two subcategories – basic/basic; basic/disease-focused; applied/translational; and applied/clinical. Expert neuroscientists then assigned projects to these categories based on careful review of abstracts, specific aims, and, when necessary, additional sections of the grant application. Because a single application often proposed research in more than one subcategory, we assigned percentages of a grant to each subcategory as appropriate. Our analysis covered nine years between 1997 and 2013.

DEFINITIONS

Basic Research:

Aimed at understanding the structure and function of the nervous system. Can involve studies performed in vitro, in animals, or in humans

- **Basic / Basic:** Focuses on the normal functions of the nervous system, whether *in vitro*, in animals, or in humans
- **Basic / Disease-Related:** Focuses on disease mechanisms; derives its primary rationale from understanding diseases. Can be *in vitro*, in animals, or in humans

Applied Research:

Aimed at developing or testing diagnostics, therapeutics, or preventive interventions, whether *in vitro,* in animals, or in humans

- **Applied / Translational:** Up to, but not including, first in human
- **Applied / Clinical:** First in human through phase III trials

National Institute of Neurological Disorders and Stroke

RESULTS

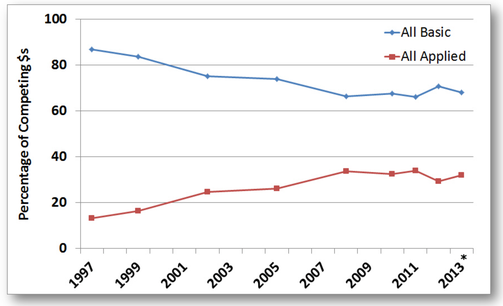

FIGURE 1. As a fraction of the competing research budget, applied research increased from 13% to 32% between 1997 and 2013. Over this same time period, basic research decreased from 87% to 68%. Similar, though somewhat attenuated trends were observed when data were analyzed by the percentage of grants awarded in these two categories. * Indicates preliminary data

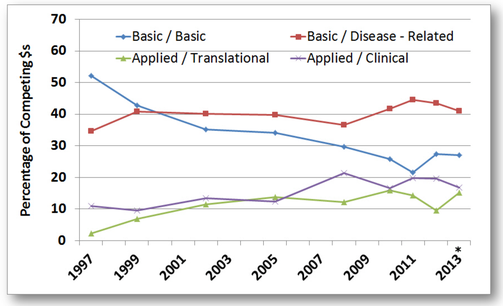

FIGURE 2. Parsing the data shown in Figure 1 in to the four defined subcategories revealed a striking decline in basic / basic research, from 52% in 1997 to 27% in 2013 (Δ 25%). * Indicates preliminary data

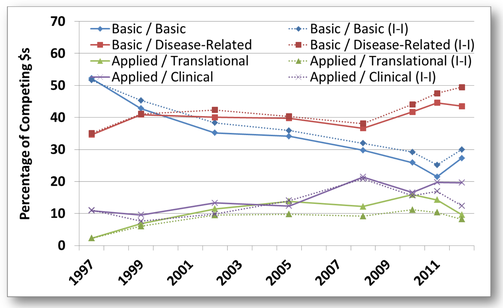

FIGURE 3. To begin to assess the extent to which NINDS solicitations were driving the changes in the relative funding of basic and disease-focused grants, we used approaches described in an accompanying poster by Torborg et al. Analysis of the research trends in the portion of the NINDS portfolio that was unsolicited and investigator-initiated (e.g. Not Influenced + NINDS-Selected) revealed a similar, though somewhat attenuated decline (52% to 30%, [Δ 22%]) in basic / basic research and accompanying increases in disease-focused research over the time period studied.

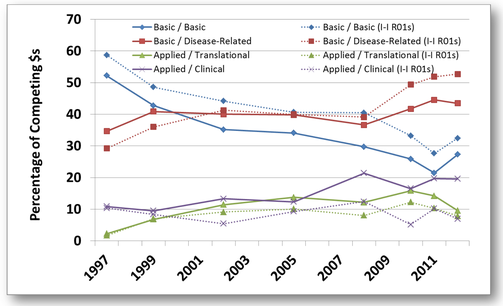

FIGURE 4. As R01s are considered by many to be the foundation of NIH support in the research community, we further parsed our data to analyze the research trends in investigator-initiated R01s (also includes R29, R37, and R56). In this subset of the NINDS portfolio, basic / basic research was more significantly represented over the time period studied; however experienced a decline of a similar magnitude (59% in 1997 to 32% in 2012 (Δ27%).

Funding Rate				
	Basic/Basic	Basic/Disease-Related	Applied/Translational	Applied/Clinical
2008	26%	20%	18%	22%
2011	26%	22%	14%	22%

FIGURE 5. To begin to understand the extent to which the decline in basic / basic research may be the result of a review environment that favors disease-focused research, we coded funded and unfunded applications for two fiscal years (FY08 and FY11) and compared the funding rate (# of funded applications / # of total applications) in each of the four categories. These data revealed that basic / basic applications fared as well as (if not better than) applications in each of the other three categories.

Change in applications requested 2008 -> 2011				
	Basic/Basic	Basic/Disease-Related	Applied/Translational	Applied/Clinical
# of applications	-23%	22%	41%	66%
$s requested	-21%	23%	42%	38%

FIGURE 6. Analysis of funded and unfunded applications submitted in each of the four categories revealed a marked decline in basic / basic proposals between FY08 and FY11 and increases in each of the other categories studied.

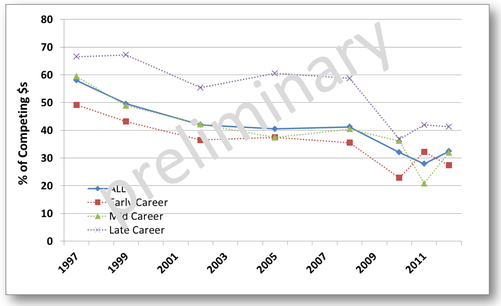

FIGURE 7. To understand whether investigators at particular career stages preferentially conduct basic / basic or disease-focused research, we binned investigators based on time between their 1st RPG and the year of the coded award. Early: 0 -5 years; Mid: 6-20 years; Late: >20 years. Analysis of the career stage of investigators funded to conduct basic / basic research revealed that this type of research is disproportionally performed by PIs later in their careers.

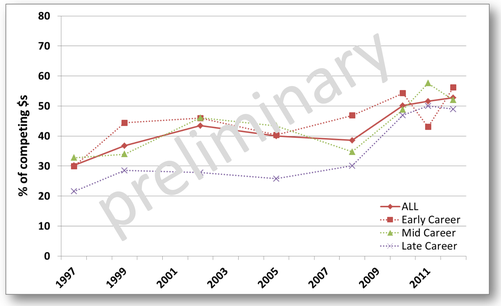

FIGURE 8. Using the approach described in Figure 7, analysis of the career stage of investigators funded to conduct basic / disease-related research revealed that PIs later in their careers performed less of this type of research.

CONCLUSIONS

Our analysis has revealed a systemic and precipitous decline of funded basic / basic research in the NINDS portfolio that appears to driven largely by a decline of applications submitted by the research community. We continue to expand our analysis to better understand the factors that have contributed to the decline in basic / basic research; however, these findings are of concern to the NINDS leadership, and have led to a number of significant changes across the Institute. Some of the changes include a modification of the NINDS mission statement to emphasize the importance of basic research, an emphasis on basic research when considering applications beyond the payline for funding, and a public outreach effort to underscore the Institute's commitment to basic research (http://blog.ninds.nih.gov/). These changes likely contribute to the uptick observed in basic / basic research since 2011.